DOCUMENT RESUME

ED 360 168 SE 053 547

| | |
|---|---|
| AUTHOR | Hartsfield, John, Comp.; Sellers, Millie, Comp. |
| TITLE | An Outline of the Solar System: Activities for the Elementary Student. |
| INSTITUTION | National Aeronautics and Space Administration, Cleveland, Ohio. Lewis Research Center. |
| PUB DATE | Dec 86 |
| NOTE | 43p. |
| AVAILABLE FROM | Aerospace Education Services Project, NASA Lewis Research Center, Cleveland, OH 44135. |
| PUB TYPE | Guides - Classroom Use - Teaching Guides (For Teacher) (052) -- Guides - Classroom Use - Instructional Materials (For Learner) (051) |
| EDRS PRICE | MF01/PC02 Plus Postage. |
| DESCRIPTORS | *Astronomy; Elementary Education; *Elementary School Science; Elementary School Students; Learning Activities; *Science Activities; Science Instruction; Scientific Concepts; Scientific Literacy; *Solar System; Space Exploration; *Space Sciences |
| IDENTIFIERS | Comets; Moon; Planets |

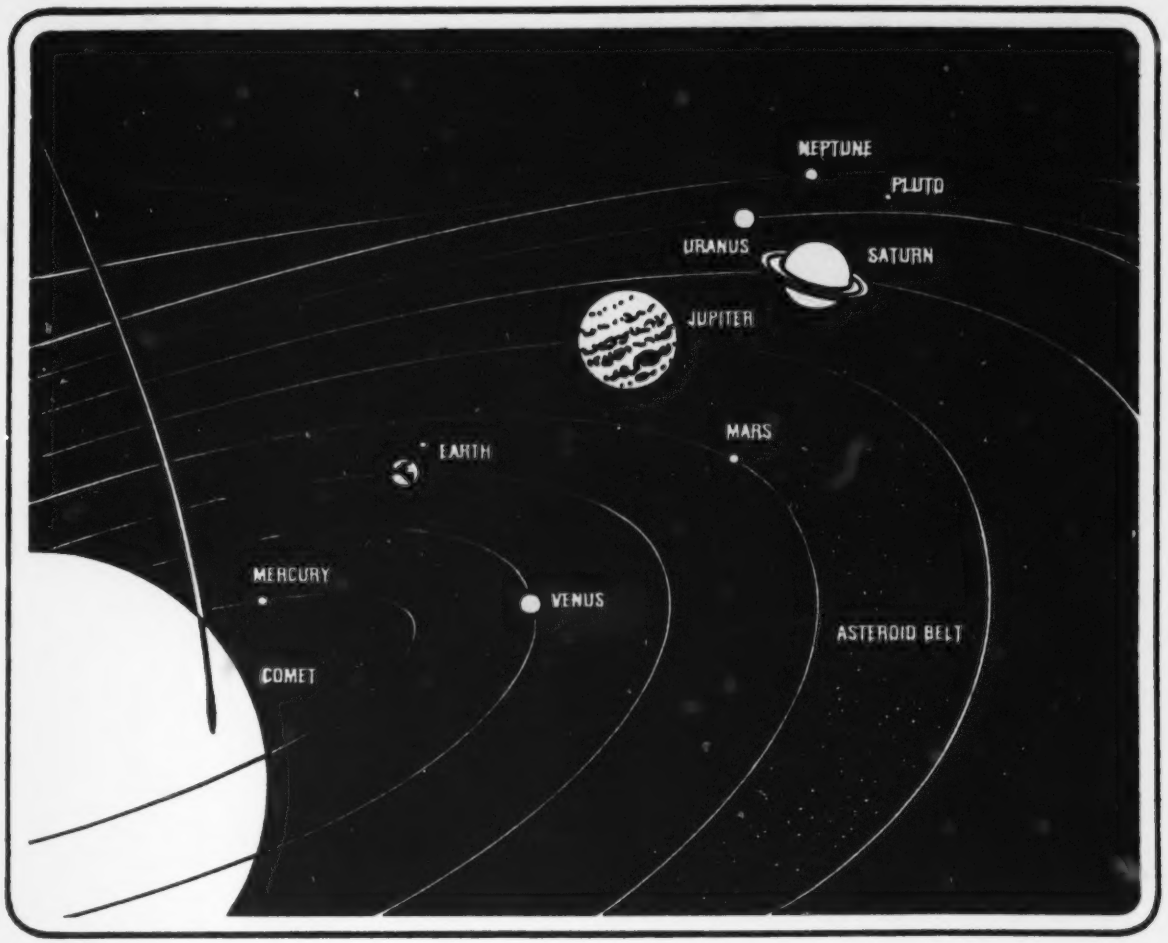
ABSTRACT

This booklet provides information and five worksheets for elementary students studying the solar system. Fact sheets provide information on the sun, Mercury, Venus, Earth, Moon, Mars, asteroids, Jupiter, Saturn, Uranus, Neptune, Pluto, and comets. The worksheets are entitled: (1) Astronomical Unit; (2) Solar System Trivia; (3) Solar System Flash Cards; (4) Solar System Crossword; and (5) Solar System Word Search. (PR)

**********
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
**********

ED360168

# AN OUTLINE OF THE SOLAR SYSTEM




## Activities for the Elementary Student

AEROSPACE EDUCATION SERVICES PROJECT
NASA LEWIS RESEARCH CENTER
CLEVELAND, OHIO

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
☒ This document has been reproduced as received from the person or organization originating it.
☐ Minor changes have been made to improve reproduction quality.
• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.



BEST COPY AVAILABLE

11/9/89

# SOME FIGURES ON THE PLANETS

| | MERCURY | VENUS | EARTH | MARS | JUPITER | SATURN | URANUS | NEPTUNE | PLUTO |
|---|---|---|---|---|---|---|---|---|---|
| AU | 0.387 | 0.723 | 1.000 | 1.524 | 5.203 | 9.523 | 19.164 | 29.987 | 39.37 |
| SIDEREAL PERIOD | 88.0 d | 224.7 d | 1.000 y | 1.88 y | 11.86 y | 29.46 y | 84.01 y | 164.1 y | 247 y |
| INCL TO ECLIPTIC | 7°00' | 3°24' | defines ecl. | 1°51' | 1°18' | 2°29' | 0°46' | 1°47' | 17°10' |
| MASS* | .055 | 0.8150 | 1.00 | 0.1074 | 317.9 | 95.2 | 14.6 | 17.2 | .0019? |
| SURFACE GRAVITY* | 0.378 | 0.91 | 1.00 | 0.379 | 2.339 | 0.925 | 0.849 | 1.140 | .041? |
| EQ. RADIUS (mi) | 1,516 | 3,759 | 3,963 | 2,111 | 44,492 | 37,824 | 15,970 | 15,380 | 932? |
| RADIUS | 0.31 | .91 | 1.00 | 0.532 | 11.89 | 9.4 | 4.03 | 3.9 | 0.204? |
| MEAN DENSITY ($g/cm^3$) | 5.44 | 5.269 | 5.517 | 3.945 | 1.314 | 0.704 | 1.21 | 1.66 | 0.8? |
| ROTATION (Synodic) | 176.0d | 116.7d | 24h | 24h39m35s | 9h55m33s | 10h14m | 17h | 16h6-7min | 6d9h18m? |
| (Sidereal) | 58.6d | 243.0d | 23h56m4s | 24h37m23s | 9h55m30s | same | same | same | same |
| INCLINATION OF EQ. (to orbit) | near 0° | 17.5° | 23.45° | 25.2° | 3.1° | 26.7° | 97.9° | 28.8° | ? |
| SATELLITES | 0 | 0 | 1 | 2 | 16 | 21+ | 15 | 8 | 1 |
| Discovered by: | | | | | | | Herschel | Adams Leverrier | Tombaugh |
| Date Discovered | | | | | | | 1781 | 1846 | 1930 |

* Compared to Earth

AU - Astronomical Unit- Equivalent to Earth-Sun distance (~ 93 million miles) thus Earth is 1 AU from the Sun.

Synodic- length of Solar day, or average time for successive passages of the Sun overhead as would be seen from the planet.

Sidereal- length of stellar day, or average time for successive passages of same star overhead as would be seen from the planet.

# AN OUTLINE OF THE SOLAR SYSTEM

## ACTIVITIES FOR ELEMENTARY STUDENTS

Note to teachers: This activity has been designed to enhance the curriculum for elementary students. Duplication of the material for classroom use is encouraged.

An Outline of the Solar System was compiled by John Hartsfield and Millie Sellers, Aerospace Education Services Project, NASA Lewis Research Center. Graphics by Les Bossinas and cover design by Richard Czentorycki, Graphics Department, NASA Lewis Research Center. Credit goes to the National Geographic Picture Atlas of Our Universe as a most helpful resource.

Aerospace Education Services Project
NASA Lewis Research Center
Cleveland, Ohio 44135



12/86. This is the work of the U.S. Government under Section 17 USC 105.

# SUN

1. THE SUN WAS FORMED 5 BILLION YEARS AGO FROM A HUGE CLOUD OF GAS.
2. THE SUN IS EARTH'S NEAREST STAR. IT IS AN AVERAGE SIZED STAR.
3. IN ANCIENT TIMES, PEOPLE THOUGHT THE SUN WAS A PERFECT SPHERE OF CELESTIAL FIRE CREATED BY THE GODS.
4. THE SUN'S ENERGY IS PRODUCED BY NUCLEAR REACTION.
5. THE SUN SHAPES LIFE ON EARTH THROUGH WEATHER AND CLIMATE.
6. THE SUN IS MADE OF MAINLY HYDROGEN AND HELIUM.
7. ONE MILLION EARTHS COULD FIT INSIDE THE SUN.
8. DIAMETER OF THE SUN: 864,000 MILES.
9. THE SUN CONTAINS 99% OF THE TOTAL MASS OF OUR SOLAR SYSTEM.
10. THE SUN SPINS ON ITS AXIS FROM LEFT TO RIGHT.
11. EARTH RECEIVES ONLY A BILLIONTH OF THE TOTAL ENERGY OUTPUT OF THE SUN.
12. THE ENERGY WE RECEIVE FROM THE SUN WAS FORMED 50 MILLION YEARS AGO.
13. THE SUN CONSISTS OF THREE LAYERS: PHOTOSPHERE, CHROMOSPHERE, AND CORONA.
14. "SUN-SPOTS" ARE GIANT MAGNETIC FIELDS THAT COOL AREAS OF THE SUN.
15. TEMPERATURE OF THE SUN'S CORE: 15 MILLION KELVIN.
16. THE SUN WILL BURN FOR AT LEAST ANOTHER 5 BILLION YEARS.
17. SYMBOL FOR THE SUN IS THE "EGG OF CREATION".

# APOLLO

BOTH GREEK AND ROMAN MYTHOLOGY NAMED APOLLO AS THE GOD OF THE SUN, WHO BROUGHT LIFE-GIVING HEAT AND LIGHT TO EARTH. AS PATRON GOD OF MUSICIANS AND POETS, HE CARRIED A LYRE, OR HARP. HE WAS CONSIDERED THE MOST HANDSOME OF ALL THE GODS. HE HAD GOLDEN HAIR, WORE A TUNIC OF GOLDEN PANTHER SKIN, AND WAS ARMED WITH A GOLD BOW AND GOLD ARROWS. EVEN HIS CHARIOT WAS MADE OF BEATEN GOLD, PULLED BY SNOW-WHITE HORSES WITH GOLDEN MANES AND FLAMING EYES.

# MERCURY

1. MERCURY IS THE INNERMOST OF THE PLANETS.
2. IT RESEMBLES THE EARTH'S MOON.
3. MERCURY HAS NO MOON OF ITS OWN.
4. MERCURY'S DAY EQUALS 3 EARTH MONTHS.
5. MERCURY'S GRAVITY IS ABOUT 1/3 OF EARTH'S GRAVITY.
6. ITS DIAMETER IS 3,025 MILES.
7. MERCURY TRAVELS AROUND THE SUN EVERY 88 EARTH DAYS.
8. IT HAS VIRTUALLY NO ATMOSPHERE.
9. IT HAS A WEAK MAGNETIC FIELD AND A TRACE OF ATMOSPHERE, A TRILLIONTH THE DENSITY OF THE EARTH'S, AND COMPOSED CHIEFLY OF ARGON, NEON AND HELIUM.
10. MERCURY'S ORBIT IS MORE ELLIPTICAL THAN ANY OTHER PLANET IN THE SOLAR SYSTEM EXCEPT PLUTO'S.
11. TEMPERATURE ON MERCURY:+950° F. ON THE SUNLIT SIDE AND -210° F. ON THE DARK SIDE.
12. MERCURY HAS A CRUST OF LIGHT SILICATE ROCK.
13. ITS IRON CORE IS ABOUT THE SIZE OF EARTH'S MOON.
14. MARINER 10 GAVE US THE FIRST CLOSE-UP PHOTOGRAPHS OF MERCURY'S SURFACE, MARCH 1974.
15. MERCURY'S SYMBOL: THE MESSENGER'S SYMBOL -- WITH IMAGINATION, YOU CAN SEE THE SNAKES ENTWINED.

# MERCURY

MERCURY WAS THE MESSENGER OF THE ROMAN GODS. HE WAS VERY SWIFT, WITH WINGS ON HIS HEELS AND HAT. FOR PROTECTION, HE CARRIED A STAFF ENTWINED WITH TWO SNAKES. THIS MARVELOUS STAFF CALLED A CADUSEUS, ORIGINALLY BELONGED TO MERCURY'S BROTHER, APOLLO. MERCURY HAD INVENTED THE LYRE. WHEN APOLLO HEARD ITS WONDROUS MUSIC, HE OFFERED TO TRADE HIS PROTECTIVE STAFF FOR THE INSTRUMENT. SO MERCURY WAS ALSO KNOWN AS THE PATRON OF COMMERCE AND TRADING, AMONG OTHER THINGS.

THE CADUSEUS IS ALSO THE PHYSICIAN'S SYMBOL.

# VENUS

1. Venus is the second planet from the Sun.
2. It is covered by clouds that move from east to west.
3. These clouds are moving three times faster than winds in a hurricane.
4. Venus has a surface temperature of +900° F.
5. Its atmospheric pressure is 97 times that of Earth.
6. Its upper clouds contain sulfuric acid.
7. Venus rotates "backward" -- the Sun rises in the west.
8. The orbit of Venus is nearly circular.
9. There is evidence of two major activity volcanic areas in its surface.
10. Concentration of lightning over the volcanic regions suggests frequent volcanic activity.
11. Venus has a nickel-iron core.
12. No magnetic field has been found.
13. Venus circles the Sun every 224.7 Earth days.
14. One Venusian day would equal 243 Earth days.
15. The gravity of Venus is .91 that of Earth's.
16. The diameter of Venus: 7,502 miles.
17. The planet probably had seas at one time.
18. Seventeen space missions have been sent to Venus: 12 from Russia and 5 from the United States.
19. The symbol for Venus resembles a hand mirror.

# VENUS

LOVE AND BEAUTY, SPRINGTIME AND FLOWERS -- THIS ROMAN GODDESS RULED THEM ALL. WHAT BETTER SYMBOL FOR HER BRIGHT PLANET THAN A HAND MIRROR?

# EARTH

1. EARTH IS THE PLANET ON WHICH WE LIVE. IT IS THE ONLY PLANET WE KNOW THAT HAS LIFE ON IT.
2. EARTH IS THE THIRD PLANET FROM THE SUN.
3. THIS PLANET HAS ONE MOON.
4. SEEN FROM SPACE, EARTH IS BLUE AND WHITE IN COLOR.
5. OVER 70% OF THE PLANET'S SURFACE IS COVERED BY WATER.
6. ATMOSPHERE: 78% NITROGEN, 21% OXYGEN, 1% OTHER GASES.
7. IT HAS A STRONG MAGNETIC FIELD.
8. THERE IS VOLCANIC ACTIVITY ON THIS PLANET.
9. IT HAS A NICKEL-IRON CORE.
10. EARTH CIRCLES THE SUN EVERY 365 DAYS.
11. A DAY ON EARTH IS 23 HOURS, 56 MINUTES LONG.
12. ITS DIAMETER: 7,909 MILES.
13. AVERAGE DISTANCE FROM THE SUN: 93,000,000 MILES.
14. THE PLANET TILTS 23½° ON ITS AXIS, CAUSING SEASONAL CHANGES.
15. EARTH HAS A CHANGING WEATHER PATTERN.
16. THE PLANET IS MADE UP OF 3 LAYERS: CRUST, MANTLE AND CORE.
17. THE PLANET IS COVERED WITH SEVERAL MOUNTAIN RANGES.
18. IT HAS FIVE CONTINENTS.
19. THE VAN ALLEN BELT IS AN INTENSE RADIATION ZONE SURROUNDING THE EARTH.
20. PLANETARY SYMBOL OF EARTH IS THE GREEK SIGN FOR SPHAIRA, SPHERE.

# EARTH

GAEA, OR GE, WAS THE EARTH GODDESS OF THE ANCIENT GREEKS. ROMANS CALLED HER "TERRA MATER" -- EARTH MOTHER.

GE LENDS HER NAME TO THE SCIENCE THAT DEALS WITH EARTH AND ITS LIFE -- GEOGRAPHY.

THE GREEK SIGN FOR A SPHERE IS EARTH'S SYMBOL.

# MOON

1. THE MOON IS A NATURAL SATELLITE OF EARTH.
2. ITS AVERAGE DISTANCE FROM EARTH: 238,328 MILES.
3. THE MOON HAS ONLY ONE-SIXTH OF EARTH'S GRAVITY.
4. THE MOON'S DIAMETER: 2,155 MILES.
5. TEMPERATURE ON ITS SURFACE: EITHER HOT OR COLD.
6. THE MOON HAS NO MAGNETIC FIELD.
7. IT HAS LIGHT AND DARK AREAS, CALLED HIGHLANDS AND SEAS.
8. IN THE PAST, HUGE METEORITES BOMBARDED THE SURFACE AND LEFT HUNDREDS OF THOUSANDS OF IMPACT CRATERS.
9. THE MOON PASSES THROUGH PHASES AS IT TRAVELS AROUND THE EARTH.
10. HUMAN BEINGS HAVE LANDED ON THE MOON SIX TIMES.
11. ROCK AND SOIL SAMPLES RETURNED TO EARTH: 842 POUNDS.
12. FOUND: NO LIFE, NO WATER, NO OXYGEN.
13. THE MOON HAS ALSO BEEN STUDIED BY UNMANNED RANGER, SURVEYOR, LUNAR ORBITER, AND RUSSIAN LUNA LANDINGS.
14. HIGH AND LOW TIDES ON EARTH'S OCEANS ARE AFFECTED BY THE MOON'S GRAVITATIONAL PULL.
15. WHERE DID THE MOON COME FROM? NO ONE KNOWS THE ANSWER.
16. SYMBOL: A CRESCENT MOON.

# MOON

DIANA, THE ROMAN GODDESS OF THE MOON, WAS THE TWIN SISTER OF APOLLO, THE SUN GOD. ANOTHER NAME FOR HER WAS LUNA, WHICH GIVES US THE WORD "LUNAR".

DIANA WAS ALSO THE PATRONESS OF ANIMALS AND HUNTING, AND SHE CARRIED A SILVER BOW AND SILVER ARROWS. IT WAS SAID THAT WHENEVER SHE SHOT AN ARROW, ANOTHER WOULD APPEAR INSTANTLY IN HER QUIVER, SO THAT SHE WAS NEVER UNPREPARED.

HER SYMBOL IS THE CRESCENT MOON -- THE SILVER BOW OF THE HUNTRESS.

# MARS

1. MARS IS THE FOURTH PLANET FROM THE SUN.
2. IT HAS A RED COLOR TO IT.
3. IT HAS TWO POTATO-SHAPED MOONS. PHOBOS IS 16.7 MILES LONG, AND DEIMOS IS 9.3 MILES LONG.
4. MARS TRAVELS AROUND THE SUN EVERY 687 EARTH DAYS.
5. ONE MARTIAN DAY IS 24 HOURS, 37 MINUTES LONG.
6. MARS' GRAVITY IS ABOUT ONE-THIRD THAT OF EARTH'S. (.38).
7. DIAMETER OF THE PLANET: 4,212 MILES.
8. SIX U.S. MISSIONS HAVE BEEN SENT TO MARS.
9. THE FIRST AMERICAN SOFT LANDING ON THE SURFACE OF ANOTHER PLANET WAS ON JULY 20, 1976, BY VIKING 1.
10. THERE ARE STRONG WINDS ON THE SURFACE: 200 TO 300 MPH.
11. HIGH AND LOW SURFACE TEMPERATURES AT VIKING 1 AND 2 LANDING SITES: MINUS 17° F. AND MINUS 191° F.
12. EVIDENCE INDICATES THERE HAS BEEN SURFACE WATER ON MARS IN THE PAST.
13. ITS ATMOSPHERE IS PRIMARILY THIN CARBON DIOXIDE.
14. IT HAS ICE CAPS OF FROZEN CARBON DIOXIDE (DRY ICE).
15. THERE IS A LONG VALLEY ON THE SURFACE OF MARS, VALLES MARINERIS, WHICH IS 3,100 MILES LONG AND 310 MILES ACROSS.
16. MARS HAS ONE HIGH MOUNTAIN CALLED OLYMPUS MONS, WHICH HAS A BASE THE SIZE OF THE STATE OF MISSOURI.
17. THE PLANET HAS A ROCKY INTERIOR THAT IS LOW IN METAL (IRON SULFIDE).
18. IS THERE, OR WAS THERE EVER, LIFE ON MARS?
19. PLANETARY SYMBOL: A SHIELD AND SPEAR.

# MARS

MARS WAS THE ROMAN GOD OF WAR. THE RED PLANET, LIKE A BADGE OF BLOOD IN THE SKY, HAS LONG STOOD FOR GODS OF WAR IN MANY ANCIENT BELIEFS. THE SHIELD AND SPEAR OF THE WARRIOR FORM THE PLANET'S SYMBOL.

MARS HAD TWO SONS, PHOBOS AND DEIMOS, WHOSE NAMES MEAN "FEAR" AND "TERROR".

MARS ALSO GIVES HIS NAME TO OUR BLUSTERY THIRD MONTH, MARCH.

# ASTEROIDS

1. ASTEROIDS ARE ROCKY OBJECTS, SMALLER THAN PLANETS, THAT ORBIT THE SUN.

2. THE ASTEROID BELT ORBITS THE SUN BETWEEN THE PLANETS MARS AND JUPITER.

3. DURING THE EARLY AGE OF OUR SOLAR SYSTEM, THOUSANDS OF ASTEROIDS CRASHED INTO MERCURY, VENUS, EARTH, MARS, AND JUPITER.

4. THERE ARE TENS OF THOUSANDS OF ASTEROIDS IN THE BELT REGION.

5. THE LARGEST ASTEROID, CERES, WAS DISCOVERED IN 1801.

6. ALL THE ASTEROIDS LUMPED TOGETHER WOULD BE SMALLER THAN EARTH'S MOON.

7. ASTEROIDS OFTEN COLLIDE AND BREAK INTO PIECES.

8. SMALL CHUNKS ARE CALLED METEORIDS.

9. "APOLLO OBJECTS" ARE ASTEROIDS THAT SWOOP IN CLOSE TO THE EARTH.

10. "FALLING STARS": WHEN A METEORID ENTERS EARTH'S ATMOSPHERE, IT BURNS UP, AND WE CALL THE STREAK OF LIGHT A METEOR. IF IT SURVIVES THE JOURNEY AND STRIKES THE GROUND, IT IS CALLED A METEORITE.

11. PIONEER 10 WAS THE FIRST MAN-MADE SPACECRAFT TO TRAVEL THROUGH THE ASTEROID BELT.

# ASTEROIDS

TRADITIONALLY, ASTEROIDS ARE NAMED BY THEIR DISCOVERERS. ONE HONORS ENGLAND'S QUEEN VICTORIA; ANOTHER THE MYTHICAL ICARUS WHO FLEW TOO NEAR THE SUN.

SOME OF THE OTHER ASTEROIDS ARE NAMED:

CERES
PALLAS
JUNO
VESTA
EROS
APOLLO
HERMES
HEKTOR
HIDALGO
ADONIS
EUNOMIA
LAETITIA
DAVIDA
PSYCHE

# JUPITER

1. JUPITER IS THE FIFTH PLANET FROM THE SUN.
2. IT IS THE LARGEST PLANET IN OUR SOLAR SYSTEM.
3. THIS PLANET MAKES UP TWO-THIRDS OF THE MASS OF THE PLANETS IN OUR SOLAR SYSTEM. IT WOULD TAKE 318 EARTHS TO EQUAL JUPITER IN SIZE.
4. THE PLANET TRAVELS AROUND THE SUN IN 11.86 EARTH DAYS.
5. LENGTH OF ONE DAY ON JUPITER: 9 HOURS, 55 MINUTES.
6. JUPITER'S ATMOSPHERE IS MADE OF HYDROGEN AND HELIUM.
7. THE PLANET'S SURFACE GRAVITY IS 2.54 TIMES EARTH'S GRAVITY.
8. DIAMETER OF JUPITER: 88,784 MILES.
9. IN DECEMBER OF 1973, PIONEER 10 TOOK THE FIRST CLOSE-UP PHOTOS OF THIS PLANET.
10. ONE FAINT RING CIRCLES JUPITER.
11. JUPITER'S GREAT RED SPOT IS A TREMENDOUS ATMOSPHERIC STORM.
12. THE PLANET IS COVERED BY CLOUDS SEVERAL LAYERS THICK.
13. JUPITER DOES NOT HAVE A SOLID SURFACE.
14. IT HAS A POWERFUL MAGNETIC FIELD.
15. THERE ARE GIANT LIGHTNING STORMS IN ITS UPPER ATMOSPHERE.
16. IN 1610, GALILEO DISCOVERED JUPITER'S FOUR LARGEST MOONS: IO, EUROPA, CALLISTO, AND GANYMEDE. WE NOW KNOW THAT THE GIANT PLANET HAS AT LEAST 16 MOONS.
17. THERE ARE ACTIVE VOLCANOS ON IO.
18. FOUR SPACECRAFT HAVE VISITED JUPITER: PIONEER 10 AND 11, AND VOYAGER 1 AND 2.
19. JUPITER COULD BE CALLED A STAR THAT FAILED.
20. PLANETARY SYMBOL: A LIGHTNING BOLT.

# JUPITER

KING OF ROMAN GODS AND LORD OF THE SKY -- THAT WAS JUPITER. HIS NAME IS A FITTING ONE FOR OUR LARGEST PLANET.

JUPITER'S TRADITIONAL WEAPONS WERE THUNDER AND LIGHTNING, SO IT IS HIS THUNDER BOLT THAT GIVES HIS PLANET ITS SYMBOL.

# SATURN

1. THE SIXTH PLANET FROM THE SUN IS CALLED SATURN.
2. IT IS THE SECOND LARGEST PLANET IN OUR SOLAR SYSTEM.
3. IT IS THE LEAST DENSE OF THE NINE PLANETS.
4. SATURN TRAVELS AROUND THE SUN EVERY 29.48 EARTH DAYS.
5. SATURN'S DAY IS 10 HOURS 39 MINUTES 20 SECONDS LONG.
6. DIAMETER OF THE PLANET: 74,400 MILES.
7. GRAVITY ON SATURN IS 1.07 TIMES THAT ON EARTH.
8. THE FIRST CLOSE-UP VIEW OF SATURN WAS MADE BY PIONEER 11 IN 1979.
9. SATURN HAS AT LEAST A THOUSAND RINGS.
10. IT HAS 21 KNOWN MOONS.
11. ITS ATMOSPHERE IS MADE UP OF HYDROGEN AND HELIUM.
12. SATURN HAS NO SOLID SURFACE.
13. TITAN, ONE OF SATURN'S MOONS, IS THE SECOND LARGEST KNOWN MOON IN OUR SOLAR SYSTEM.
14. TITAN HAS AN ATMOSPHERE WHICH IS NITROGEN-BASED.
15. FOUR SPACECRAFT HAVE VISITED SATURN. THEY ARE PIONEER 10 AND 11, AND VOYAGER 1 AND 2.
16. PLANETARY SYMBOL: A CURVED SICKLE.

# SATURN

HARVEST TIME IN ANCIENT ITALY BELONGED TO THE GOD OF REAPING, WHOM THE ROMANS CALLED SATURN. SINCE HE ALWAYS CARRIED A SICKLE TO REAP WITH, A SYMBOL CURVED LIKE THAT SICKLE REPRESENTS THE PLANET WHICH BEARS HIS NAME.

SATURN ALSO LENDS HIS NAME TO ONE OF THE DAYS OF THE WEEK. WHICH ONE IS IT?

# U R A N U S

1. Uranus is the seventh planet from the Sun.
2. It is the third largest planet in our solar system.
3. William Herschel discovered Uranus in 1781.
4. This planet circles the Sun every 84.01 Earth years.
5. One day on Uranus is 17.24 hours.
6. Its gravity is .91 that of Earth's.
7. The planet is one-fifth denser than water.
8. Diameter of the planet: 32,116 miles.
9. Uranus is 19 times further from the Sun than Earth.
10. The planet has a blue-green shine, due to methane.
11. Its atmosphere is made up of helium, hydrogen and methane.
12. Uranus is tipped on its side. Its magnetic field is tilted 60° and offset from the planet's center.
13. Communication to Uranus takes 2½ hours.
14. We used to think that Uranus had 9 rings and 5 moons. Information from the Voyager 2 fly-by, January 1986, showed us that the planet has at least 11 rings and 15 moons.
15. Planetary symbol: sign for the metal, platinum.

# URANUS

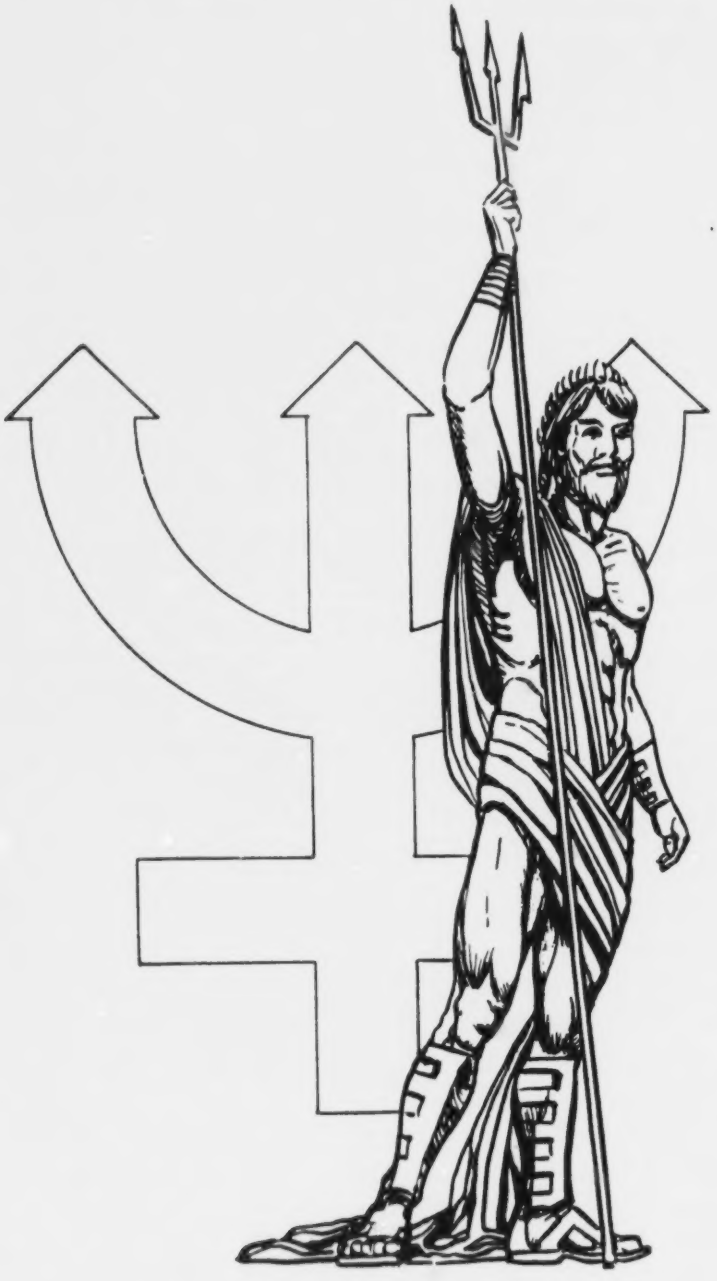
ASTRONOMERS NAMED THE SEVENTH PLANET FOR THE OLD ROMAN GOD, URANUS. HE WAS THE FATHER OF SATURN AND THE GRANDFATHER OF JUPITER.

# NEPTUNE

1. NEPTUNE IS THE EIGHTH PLANET FROM THE SUN.
2. IT IS THE FOURTH LARGEST OF OUR PLANETS, BUT IT IS THE SMALLEST OF THE GAS PLANETS.
3. THIS PLANET CIRCLES THE SUN EVERY 164.1 EARTH YEARS.
4. ONE DAY ON NEPTUNE IS 18 HOURS, 30 MINUTES EARTH TIME.
5. GRAVITY ON THE PLANET IS 1.15 OF THAT ON EARTH.
6. DIAMETER OF THE PLANET: 30,690 MILES.
7. NEPTUNE WAS DISCOVERED IN 1846. IT WAS THE FIRST PLANET FOUND BY MATHEMATICAL CALCULATION.
8. NEPTUNE IS BELIEVED TO BE A TWIN PLANET TO URANUS.
9. THE PLANET HAS A BLUE COLOR TO IT.
10. ITS ATMOSPHERE: HYDROGEN, HELIUM AND METHANE.
11. IT IS THOUGHT TO HAVE RINGS.
12. IT HAS TWO KNOWN MOONS, TRITON AND NEREID.
13. TRITON IS SLOWLY SPIRALLING IN TOWARD NEPTUNE.
14. NEPTUNE'S TRITON IS ONE OF 6 PLANETARY SATELLITES IN OUR SOLAR SYSTEM WITH RETROGRADE ORBITAL MOTION (FROM EAST TO WEST). THE OTHERS ARE: JUPITER SATELLITES ANK, CARNE PASIPHAE, AND SINOPE; AND SATURN SATELLITE PHOEBE.
15. NEPTUNE HAS A VERY COLD SURFACE.
16. VOYAGER 2 WILL FLY BY NEPTUNE ON AUGUST 25, 1988.
17. PLANETARY SYMBOL: THE TRIDENT.

# NEPTUNE

AN OCEAN GOD FOR AN OCEAN-COLORED PLANET -- NEPTUNE, ROMAN GOD OF THE SEA. AND SO ASTRONOMERS USE HIS FISHING SPEAR, THE TRIDENT, FOR THE PLANETARY SYMBOL.



# PLUTO

1. PLUTO IS THE NINTH PLANET FROM THE SUN.
2. IT HAS NOTHING IN COMMON WITH THE GAS GIANTS.
3. PLUTO WAS DISCOVERED IN 1930.
4. IT CIRCLES THE SUN EVERY 247.7 EARTH YEARS.
5. A DAY ON PLUTO EQUALS 6 DAYS, 9 HOURS, 18 MINUTES ON EARTH.
6. DIAMETER OF PLUTO: 2,170 MILES.
7. ITS SURFACE GRAVITY IS .05 OF THAT ON EARTH.
8. SURFACE TEMPERATURE IS MINUS 369° F.
9. NO ATMOSPHERE HAS BEEN DETECTED ON PLUTO.
10. PLUTO IS ABOUT THE SIZE OF EARTH'S MOON, MAKING IT OUR SMALLEST KNOWN PLANET.
11. PLUTO HAS AN ELLIPTICAL ORBIT THAT TAKES IT FROM BEING THE FARTHEST PLANET IN OUR SOLAR SYSTEM, TO CLOSER TO THE SUN THAN NEPTUNE.
12. ONE MOON, CHARON, DISCOVERED IN 1978, IS ABOUT ½ THE SIZE OF THE PLANET.
13. BY THE END OF THIS CENTURY, PLUTO WILL BE THE ONLY PLANET NOT VISITED BY A SPACE PROBE.
14. IS PLUTO REALLY A PLANET?
15. PLANETARY SYMBOL: FIRST TWO LETTERS OF PLUTO.

# PLUTO

THE GREEK GOD OF WEALTH, PLUTO RULED THE DARK UNDERWORLD OF MYTH. NOW THE DARKLY LIT OUTERMOST WORLD BEARS HIS NAME.

29

# COMETS

1. A COMET IS A VISITOR TO THE INNER SOLAR SYSTEM FROM OUTER SPACE.

2. A COMET IS MADE UP OF:

   NUCLEUS: A "DIRTY SNOWBALL" COMPOSED OF WATER ICE AND OTHER FROZEN GASES, CONTAINING ROCK DUST.

   COMA: SOLAR HEAT CHANGES THE ICES INTO A VISIBLE GAS "ATMOSPHERE". A MUCH LARGER HYDROGEN CLOUD ALSO FORMS, BUT IT CAN BE SEEN ONLY IN ULTRAVIOLET LIGHT.

   TAILS: A DUST TAIL IS FORMED BY THE PRESSURE OF SUNLIGHT PUSHING DUST PARTICLES FROM THE COMA AWAY FROM THE SUN. THE PARTICLES FORM A SMOOTH CURVED TAIL THAT REFLECTS SUNLIGHT. PLASMA TAILS (OR ION TAILS) ARE FORMED BY THE SOLAR WIND INTERACTING WITH ATOMS AND MOLECULES FROM THE COMA. THIS TAIL IS NOT AS SMOOTH AS THE DUST TAIL. SOME COMETS HAVE BOTH TAILS, SOME HAVE ONLY ONE OR THE OTHER.

3. AS A COMET RETREATS FROM THE SUN, IT COOLS. THE TAILS, HYDROGEN CLOUD, AND COMA GRADUALLY SCATTER INTO SPACE, SO THAT ONLY THE NUCLEUS REMAINS. WHEN THE COMET VISITS THE SUN AGAIN, IT WILL FORM A NEW COMA, CLOUD AND TAIL.

4. A COMET'S PERIOD IS LIKE A PLANET'S YEAR -- THE TIME IT TAKES TO COMPLETE ONE ORBIT. BUT EACH TIME A COMET APPROACHES A PLANET, ITS ORBIT MAY BE CHANGED BY THE PLANET'S GRAVITATIONAL PULL. MANY COMETS ARE EVENTUALLY PULLED CLOSE TO THE ORBIT OF GIANT JUPITER, AND THERE THEY STAY.

5. THE COMETS WE SEE ORIGINATED IN THE OORT CLOUD (NAMED FOR DUTCH ASTRONOMER JAN H. OORT), A VAST REGION OF WIDELY SEPARATED COMETS. IT IS ABOUT 100,000 TIMES FARTHER FROM THE SUN THAN EARTH IS. IT IS THOUGHT THAT OVER 100 BILLION COMETS SWARM THERE.

6. THE WORD COMET COMES FROM THE GREEK WORD KOMETES, MEANING "LONG-HAIRED".

7. WHY IS THIS PUNCTUATION MARK (,) CALLED A COMMA?

# COMETS

MOST COMETS ARE NAMED AFTER THE PEOPLE WHO DISCOVER THEM. IKEYE-SEKI HONORS JAPANESE AMATEUR ASTRONOMERS KAORU IKEYE AND TSUTOMU SEKI. ENGLAND'S SIR EDMUND HALLEY PREDICTED THE REUTRN OF THE COMET THAT BEARS HIS NAME, BUT HE DID NOT LIVE TO SEE IT. BETWEEN 1786 AND 1797, CAROLINE HERSCHEL OF ENGLAND DISCOVERED EIGHT COMETS.

IN ANCIENT TIMES, PEOPLE BELIEVED THAT COMETS WERE THE SOULS OF HEROS OR KINGS ON THEIR WAY TO HEAVEN, OR PERHAPS MESSENGERS OF COMING DISASTERS.

## SOME COMETS OF NOTE

| NAME | PERIOD (YEARS) | COMMENTS |
|---|---|---|
| ENKE | 3.3 | SHORTEST KNOWN ORBIT FOR A COMET. |
| TEMPEL 2 | 5.26 | |
| PONS-WINNECKE | 6.3 | |
| GIACOBINI-ZINNER | 6.41 | FIRST COMET TO BE VISITED BY A SPACECRAFT, ICE (1985). |
| SCHWASSMANN-WACHMANN 1 | 16.1 | ALMOST CIRCULAR ORBIT. |
| HALLEY | 76 | THE MOST STUDIED COMET IN HISTORY! |
| BENNET | 1730 | GREAT COMET OF 1970. |
| KOHOUTEK | 83,100 | GREAT EXPECTED COMET OF 1974, BUT IT WASN'T MUCH. |
| IKEYA-SEKI | 89,400 | SUN GRAZER IN 1965, IT BECAME ONE OF THE BRIGHTEST COMETS OF THIS CENTURY. NEXT VISIT COULD BE EVEN BETTER! |

# ASTRONOMICAL UNIT

Introduction:

In the study of astronomy, astronomers use a convenient unit of measurement known as an ASTRONOMICAL UNIT or A.U. The A.U. is a "short cut" in describing distances in the solar system. The distance between the Sun and Earth is 149,600,000 kilometers (93 million miles). Astronomers let the distance between Earth and the Sun represent 1 A.U. An object twice as far away from the Sun would then be 2 A.U. A.U. is really a scale showing distances. The scale used here is 1 A.U. = 149,600,000.

Objective:

To give students a better understanding of distance between the planets and the Sun.

Materials:

Adding machine tape, 40 meters long (1 per group)
1 meter stick per group
Pencil
Scissors

Procedure:

1. Divide students into working groups.
2. Have each group extend their 40 meters of adding machine tape out and tape to floor. Hallways or gym floor would be good working areas. Remember each group will need a working area.
3. Identify one end of the tape as the Sun.
4. Measure one meter from the Sun. Label that point as the Earth.
5. The remaining planets and asteroid belt can be determined by using the chart on the reverse side of this sheet.
6. As you mark off the planets, use the symbol for the planet, along with the planet's name.

Suggestion:

When the students have marked off the solar system in astronomical units on the adding machine tape, find a location at school where this distance scale of the solar system can be displayed. The entire school population can then see and use this scale. Example: use colored chalk (or paint for a more permanent display) to mark the planet's name and symbol on a hallway floor in the school, parking lot, sidewalk, or on some other heavily traveled location. Students can also include on their A.U. scale the number of moons for each planet, rotation and revolution of each planet, equatorial diameter of each planet, etc.

| Planet | Symbol | A.U. | |
|---|---|---|---|
| Mercury | ☿ | 38 centimeters | 15 inches |
| Venus | ♀ | 72 centimeters | 29 inches |
| Earth | ⊕ | 1 meter | 1 yard 3 inches |
| Mars | ♂ | 1 meter 52 centimeters | 1 yard 24 inches |
| Asteroid Belt | | 2 meters 80 centimeters | 3 yards 2 inches |
| Jupiter | ♃ | 5 meters 20 centimeters | 5 yards 23 inches |
| Saturn | ♄ | 9 meters 52 centimeters | 10 yards 12 inches |
| Uranus | ♅ | 19 meters 20 centimeters | 20 yards 29 inches |
| Neptune | ♆ | 30 meters | 32 yards 18 inches |
| Pluto | ♇ | 39 meters 40 centimeters | 42 yards 25 inches |

SOLAR SYSTEM TRIVIA

1. Which planets in our solar system do not have any moons?
2. Where do astronomers think most comets come from?
3. It takes eight _____ for energy released from the sun's outer layer to reach the Earth.
4. Name the three layers of the sun.
5. What are "sunspots"?
6. If you weighed 99 pounds on the Earth, how much would you weigh on Mercury?
7. What spacecraft gave us the first close-up photographs of Mercury's surface?
8. The symbol for this planet is a hand mirror.
9. How long is an Earth year?
10. Name the three different layers of the Earth.
11. Of what is the core of the Earth made?
12. What is the moon's gravity?
13. What effect does the moon's gravitational pull have on the Earth?
14. Why is the soil on Mars red?
15. Name the moons of Mars.
16. When was the first American soft landing on the surface of another planet? And on which planet?
17. Could you breath the atmosphere on Mars?
18. Name one of the two planets whose day is almost the same length as an Earth day.
19. Mars, according to Roman mythology, had two sons, Phobos and Deimos. Their names mean _____ and _____.
20. What month of the year is named after Mars?
21. What are asteroids?
22. Where is the asteroid belt located?
23. First man-made spacecraft to travel through the asteroid belt.
24. How are asteroids named?

25. How long is a day on Jupiter?

26. What is the red spot on Jupiter?

27. What is Jupiter's symbol?

28. How many rings are around Saturn?

29. How long is a day on Saturn?

30. This planet is the least dense of all the planets.

31. How many moons does Saturn have?

32. How many NASA spacecraft have visited Saturn?

33. How long is a day on Uranus?

34. What planet has the greatest number of natural satellites?

35. What is the symbol for Uranus?

36. How many planets are thought to have rings?

37. First planet to be discovered by mathmatical calculation.

38. When was Pluto discovered?

39. If you weighed 100 pounds on Mars, how much will you weigh on Earth?

40. Name the parts of a comet.

41. First comet to be visited by a spacecraft.

42. Planet with the least amount of gravity.

43. Planet with the strongest gravity.

44. There are three planets that have days approximately 24 hours long. Can you name them?

45. What planet has the shortest day?

46. How many moons are there in our solar system?

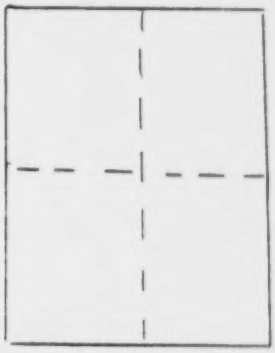
## SOLAR SYSTEM FLASH CARDS

A motivational learning tool with step-by-step instructions. To accompany An Outline of the Solar System activity book.

MATERIALS: typing paper, scissors (optional), pen or pencil.

PROCEDURE:

1. Give each student 3 sheets of typing paper.
2. Have student fold each sheet of paper into 4 equal parts. (Fold bottom to top and side to side.)
3. Neatly tear or cut each sheet into 4 smaller pieces, using the fold as the cutting line. Each student now has 12 pieces of paper.



4. Draw a different planet's symbol on each of 9 rectangles of paper.
5. On the 10th rectangle, draw the symbol for the sun.
6. On the 11th rectangle, draw the symbol for the moon.
7. On the 12th rectangle, write the following 9 words: MY VERY EDUCATED MOTHER JUST SERVED US NINE PIZZAS. (These words use the first letter of each of the nine planets in order from the sun outward. Example: MY: Mercury; VERY: Venus; EDUCATED: Earth; etc.).

A good film to use with this activity is Our Solar System, NASA HQ-234.

## ADDITIONAL SUGGESTED ACTIVITES

* Bulletin Board: Have students bring current newspaper and magazine articles relating to the solar system/space prior to unit of study. Use these as informal motivational stimulators.

* Use appropriate computer software if available.

* Plan a trip to the local planetarium or invite informed speaker to visit the class.

* Math: Calculate own weight on each of the planets of the solar system.

* Simulation activities suggestions:

  Divid the class into groups. Assign identities as citizens of a future society in space., for example:

  1. Design a spacecraft.
  2. Construct a map of your assigned planet's busy city.
  3. Plot navigation courses to other places (math/social studies skills).
  4. Write a newspaper as life might be on your assigned planet
  5. Career choices in this new environment.

* Student projects might include:

  1. Solar system hanging mobile.

  2. Oral report with student acting as an alien from one of the planets, asteroid belt, or comet. Use facts to describe "home environment", and imagination to add interest.

  3. Oral report on pulsars, quasars, or black holes.

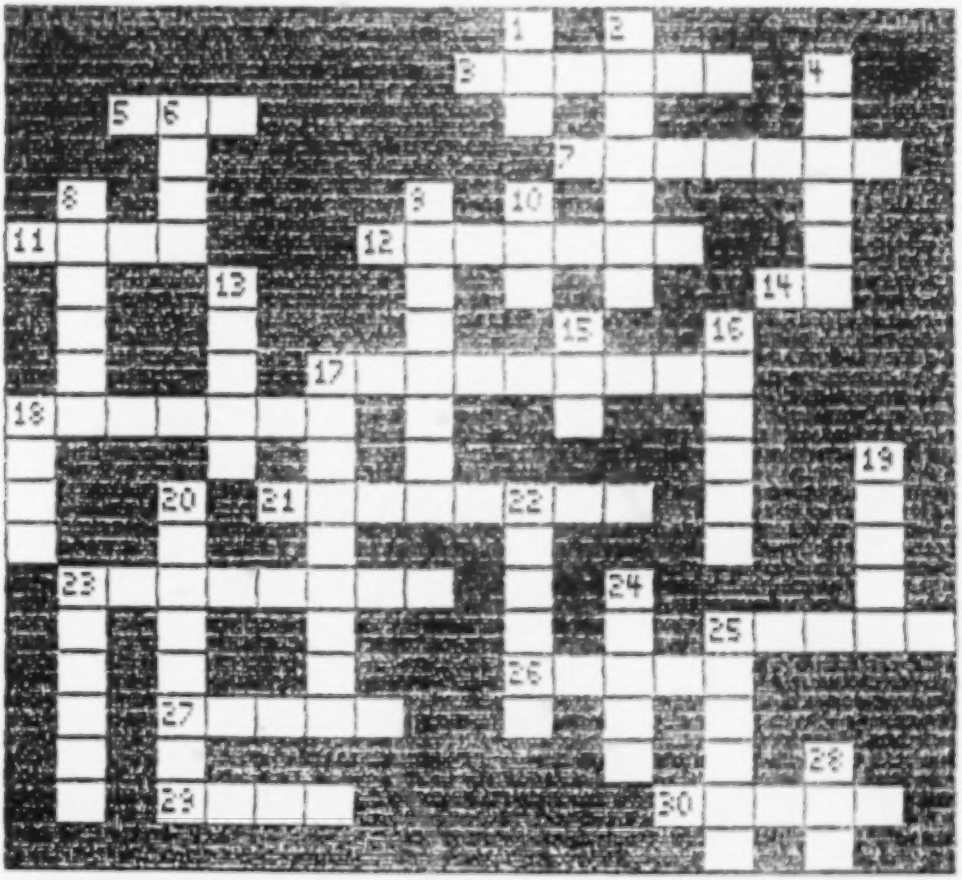
# SOLAR SYSTEM CROSSWORD

ACROSS:

3. If this planet was dumped into a huge glass of water, it would float.
5. In ancient Rome, Neptune ruled this.
7. Number of Earths that would fit inside the sun.
11. Number of continents on the Earth.
12. I discovered Jupiter's four largest moons.
14. This moon has active volcanos.
17. Mercury was the _____ of the Roman gods.
18. This gas causes Uranus to have a blue-green shine.
21. I discovered Uranus in 1781.
23. Acid contained in Venus's upper clouds.
25. Greek god of wealth.
26. The third planet from the sun.
27. It covers over 70% of the Earth's surface.
29. The time it takes for Earth to travel around the sun.
30. A day on this planet is longer than its year; sun rises in the west and sets in the east.

DOWN:

1. Mars, Roman god of _____.
2. Largest planet in the solar system.
4. Mercury obtained the caduseus from _____.
6. Comet with the shortest known orbit.
8. Saturn's symbol.
9. The physician's symbol.
10. Humans have landed on the moon _____ times.
13. A moon with nitrogen-based atmosphere.
15. Number of Pluto's moons.
16. Planet that is tipped on its side.
17. A falling star that survives its journey through Earth's atmosphere.
18. Earth's natural satellite.
19. I am sometimes called a dirty snowball.
20. Our galaxy.
22. Most studied comet in history.
23. Greek sign for Earth.
24. Largest known asteroid.
25. What the moon passes through as it travels around the Earth.
28. Its symbol is "the egg of creation".






BEST COPY AVAILABLE

# SOLAR SYSTEM WORD SEARCH

J D I A N A T N M Q A X V U J D Z R
R H M A P E P D V C J C M B J C S D
S N C K M H P U G X U D H Y L F B O
Y J Z O H P O T C T P T Q A Q B R M
V W C G E Y U B U A I W E A R T H H
P Q A V K T N I O N T D E I M O S L
W E Q Q P C A D U S E U S B S G N G
I Y D B D A H M N M R L I U N O H H
P M M H P O J V Y C W I N D O S S S
Q B E O L L C N B W F A A M K I G M
S X R S U N A S T E R O I D S C O A
S U Y W T G L T O U Z W K T A K L D
E G I M O A L O I K C C Y S J L I H
Z Z A D T R I D E N T R O T D E X C
D G U Q I O S S A T U R N V R J G D
X J K F T R T E A C B M X E P P L V
Z U K R A J O T R I T O N N J R L R
K O F M N I F E X U X H Z U S E E K
M K Y H D A M E N J M U C S L B V Z

Can you find these words?

ASTEROIDS
CADUSEUS
CALLISTO
CHARON
COMET
DEIMOS
DIANA
EARTH
EUROPA
GANYMEDE
IO
JUPITER
MARS
MERCURY
MOON
NEPTUNE
NEREID
PHOBOS
PLATINUM
PLUTO
SATURN
SICKLE
SUN
TITAN
TRIDENT
TRITON
URANUS
VENUS

# BIBLIOGRAPHY

## BOOKS


Becklake, Sue. The Mysterious Universe.

D'Ignazio, Fred. The New Astronomy, Probing the Secrets of Space. Watts.

Gallant, Roy. The Planets: Exploring the Solar System. Scholastic.

Kerrod, Robin. Mission Outer Space. Lerner Publishing Co.

Kerrod, Robin. Race for the Moon. Lerner Publishing Co.

Nourse, Alan E. The Giant Planets. Watts.

Riopan, Ian. Stars and Planets.


## NASA PUBLICATIONS


EP-131 What's New on the Moon.
EP-177 A Meeting with the Universe.
EP-191 The Voyager Flights to Jupiter.
NF-87 Voyager Mission to the Outer Planets.
NF-89 The Voyager Mission.
NF-100 Voyager to Saturn.
NF-132 Images of Saturn from Voyager 2.
NF-134 Our Planets at a Glance.


## FILMS


HQ230 The Moon--an Emerging Planet
HQ209 The Moon--Old and New
HQ275 Reading the Moon's Secrets
HQ263 Mars--Is There Life?
HQ264 Mars and Beyond
HQ270 A Question of Life
HQ235 Earth-Sun Relationship
HQ294 Earthspace--Our Environment
HQ281 HEA--The New Universe
HQ245 Life Beyond Earth and the Mind of Man
HQ234 Our Solar System
HQ226 Who's Out There
HQ163 A View of the Sky
HQ220 Universe
HQ196 Seed of Discovery
HQ192 A Mission for Mariner
HQ254 Partnership into Space--Mission Helios
HQ283 Mars--The Search begins
HQ282 Mercury, Exploration of a Planet
HQ243 Jupiter Odyssey
HQ62 The Clouds of Venus

# SOURCE LIST

Maps: Moon, Mars, etc.:

Superintendent of Documents, US Govt. Printing Office, Washington, DC 20402
National Geographic Society, PO Box 2806, Washington, DC 20036
US Geological Survey, Department of Interior, 1200 S. Eads St., Arlington, VA 22202
GEWA Visitor Center Gift Shop, Goddard Space Flight Center, Greenbelt, MD 20771

Solar System Information, Charts, etc.

The Hansen Planetarium, Dept. F, 1098 South 200 West, Salt Lake City, UT 84101
Smithsonian Astrophysical Observatory, 60 Garden St., Cambridge, MA 02138
Astronomical Society of the Pacific, 1290 24th Ave., San Francisco, CA 94122
GEWA Visitor Center Gift Shop, Goddard Space Flight Center, Greenbelt, MD 20771

8mm and 16mm NASA Films:

National Audio Visual Center (GSA), Washington, DC 20409

Photographs, Slides, etc.:

AW/JSC Exchange Store, Johnson Space Center, Houston, TX 77058
Astronomical Society of the Pacific, 1290 24th Ave., San Francisco, CA 94122
Woodstock Products, Inc., PO Box 2519, Beverly Hills, CA 90213
GEWA Visitor Center Gift Shop, Goddard Space Flight Center, Greenbelt, MD 20771

**Teacher Resource Centers and Where to Write or Call for Services**

Teacher Resource Centers are established to provide educators with NASA-related educational materials for use in the classroom. Those materials can be references or duplicated at the Center; they include: classroom activities, lesson plans, teacher guides, laser discs, slides, audio and video tapes.

Please contact the NASA Center that serves your state for further Teacher Resource Center material or information about other available services.

**NASA Ames Research Center**
Teacher Resource Center
Mail Stop 204-7
Moffet Field, CA 94035
(415) 694-6077
Alaska, Arizona, California, Hawaii, Idaho, Montana, Nevada, Oregon, Utah, Washington, Wyoming

**NASA Goddard Space Flight Center**
Teacher Resource Center
Mail Code 130.3
Greenbelt, MD 20771
(301) 286-8570
Connecticut, Delaware, District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont

**Jet Propulsion Laboratory**
Science and Mathematics Teaching Resource Center
c/o Education Outreach—SMTRC
Mail Stop 520
Pasadena, CA 91109
(818) 354-6916
Alaska, Arizona, California, Hawaii, Idaho, Montana, Nevada, Oregon, Utah, Washington, Wyoming

**NASA Lyndon B. Johnson Space Center**
Teacher Resource Center
Code AP-4
Houston, TX 77058
(713) 483-3455/4433
Colorado, Kansas, Nebraska, New Mexico, North Dakota, Oklahoma, South Dakota, Texas

**NASA John F. Kennedy Space Center**
Educator Resource Laboratory
Mail Code ERL
Kennedy Space Center, FL 32899
(305) 867-4090/9383
Florida, Georgia, Puerto Rico, Virgin Islands

**NASA Langley Research Center**
Teacher Resource Center
Mail Stop 146
Hampton, VA 23665
(804) 865-4468/3017
Kentucky, North Carolina, South Carolina, Virginia, West Virginia

**NASA Lewis Research Center**
Teacher Resource Center
Mail Stop 8-1
Cleveland, OH 44135
(216) 433-2017
Illinois, Indiana, Michigan, Minnesota, Ohio, Wisconsin

**NASA George C. Marshall Space Flight Center**
Teacher Resource Center
Huntsville, AL 35807
(205) 837-3400
Alabama, Arkansas, Iowa, Louisiana, Mississippi, Missouri, Tennessee

**NASA National Space Technology Laboratories**
Teacher Resource Center
Building 1200
NSTL Station, MS 39529
(601) 688-3338
(no assigned area)

## SOLAR SYSTEM TRIVIA ANSWERS

1. Mercury and Venus.
2. The Oort cloud.
3. Minutes.
4. Photosphere, chromosphere, and corona.
5. Giant magnetic fields that are cooler areas of the sun.
6. One-third of 99 pounds, or approximately 33 lbs.
7. Mariner 10.
8. Venus.
9. 365 days.
10. Crust, mantle, and core.
11. Nickle-iron core.
12. One-sixth of the Earth's.
13. High and low tides of the oceans.
14. Iron mineral on planet has rusted, because water and oxygen were present at one time during the planet's life cycle.
15. Phobos and Deimos.
16. July 20, 1976 (Mars).
17. No, it contains carbon dioxide.
18. Mars (24 hours, 37 minutes) and Uranus (24 hours).
19. Fear and Terror.
20. March.
21. Rocky objects smaller than planets, that orbit the sun.
22. Between Mars and Jupiter.
23. Pioneer 10.
24. Asteroids are usually named after their discoverers.
25. 9 hours, 55 minutes.
26. Atmospheric storm that has been occuring for over 300 years.
27. Lightning or thunder bolt.
28. At least a thousand.
29. 10 hours, 39 minutes, 20 seconds.
30. Saturn.
31. At least 21 moons.
32. Four: Pioneer 10 and 11, and Voyager 1 and 2.
33. 24 hours.
34. Saturn (21).
35. Sign for the metal platinum.
36. Four: Jupiter, Saturn, Uranus, and Neptune. Neptune's rings have not been seen yet; in August of 1989, Voyager will look for them as it flies by.
37. Neptune, 1846.
38. 1930.
39. 300 pounds.
40. Nucleus, coma, and tails.
41. Giacobini-Zinner in 1985 (ICE).
42. Pluto, .05 of that on Earth.
43. Jupiter, 2.54 times Earth's gravity.
44. Earth (23 hours, 56 minutes); Mars (24 hours, 37 minutes); Uranus (24 hours).
45. Jupiter (9 hours, 55 minutes).
46. At least 58: Earth (1); Mars (2); Jupiter (16); Saturn (21); Uranus (15); Nepturn (2); Pluto (1).

SOLAR SYSTEM CROSSWORD

ANSWER KEY

Across:

3. SATURN
5. SEA
7. MILLION
11. FIVE
12. GALILEO
14. IO
17. MESSENGER
18. METHANE
21. HERSCHEL
23. SULFURIC
25. PLUTO
26. EARTH
27. WATER
29. YEAR
30. VENUS

Down:

1. WAR
2. JUPITER
4. APOLLO
6. ENKE
8. SICKLE
9. CADUSEUS
10. SIX
13. TITAN
15. ONE
16. URANUS
17. METEORITE
18. MOON
19. COMET
20. MILKYWAY
22. HALLEY
23. SPHERE
24. CERES
25. PHASES
28. SUN

Answer Key for: SOLAR SYSTEM WORD SEARCH

```
. D I A N A T . . . . . .
. . . . P E . . . J C . . . . .
. . . . M H P . . . U . H . . . . .
. . . O . . O T . . P . . A . . . .
. . C . . . . B U . I . E A R T H .
. . . . . O N T D E I M O S .
. . . . . C A D U S E U S . S . N .
. . . . . A . . . M R . . U . O . .
. . . . P . . . Y . . . N . O S . .
. . . O L L C N . . . A . M . I . .
. . R S U N A S T E R O I D S C . .
. U . . T G L T . U . . . . . K . D
E . . . O . L O I . . . Y . . L I .
. . . . T R I D E N T R . . . E . .
. . . . I . S S A T U R N V R . . .
. . . . T R T . . C . M . E . . . .
. . . . A . O T R I T O N N . . . .
. . . M N . . E . . . . . U . . . .
. . . . . M . . . . . S . . . .
```



☆U.S. GOVERNMENT PRINTING OFFICE: 1990 - 748-158/00216